

A Model for Collaboration

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A field-tested professional development program tightens teamwork in teaching math.

If you are grappling with how to improve math achievement for students with disabilities, you're not alone. In response to NCLB and the 1997 Individuals with Disabilities Education Act, schools are now including more students with special needs in regular education mathematics classes. Many of these students are scoring below required levels on standardized assessments in mathematics (National Center for Education Statistics, 2004; Thurlow, Moen, & Altman, 2006), putting their schools in jeopardy of not meeting NCLB's Adequate Yearly Progress requirements.

As most educators have found, placing students with disabilities in mainstream math classes is not enough to ensure their success. In addition to having a solid grasp of content and setting high expectations, those who teach math to students with learning needs must also choose effective instructional strategies and make accommodations for learner differences. This is a tall order.

Through our work with teachers over the past six years, we have come to see how tall this order is. With funding from the National Science Foundation, we created and field-tested a professional development program to help middle school math and special education teachers provide the instruction students with disabilities need. Our two-year field test involved 102 teachers from five urban and suburban districts in Massachusetts (with slight variation in teachers from year to year). The percentage of students with identified disabilities in these schools ranged from 13 percent to 23 percent. The schools had different approaches to serving students with special needs, but all shared a need to improve math learning.

Common Challenges of Collaboration

Let's look at a typical example, that of Martha and Kate, that illustrates the many challenges teachers might experience. Martha was an experienced mathematics teacher who enthusiastically taught 7th graders. Although confident in her content knowledge, she felt overwhelmed by the reality that 8 of her 25 students had individualized education programs (IEPs). Martha knew little about her students' disabilities and was unsure what she should expect. She hesitated to adapt her lessons lest she "dumb them down." Martha relied on Kate, the special educator, to help her students with disabilities.

Kate, however, was only in Martha's classroom three days a week. She worked with two other teachers, each with an individual teaching style, and often dashed from math class to math class. Kate juggled numerous IEP meetings and piles of paperwork. Kate viewed

herself foremost as an advocate for her students. An experienced special educator, she had a large repertoire of learning strategies at her fingertips. However, Kate felt limited by her lack of math background. Neither did she have a scheduled planning time with the math teachers. It was hard for her to keep on top of what was happening in the classes because she was not present every day. Frustrated, Kate wondered how to move forward.

Our Professional Development Model

To help teachers like Kate and Martha help their students, we designed the Addressing Accessibility in Mathematics program.¹ The model interweaves workshops that connect research and practice with study groups that foster collaborative problem-solving, reflection, and ongoing support. It gives math and special education teachers sustained opportunities to

- Deepen understanding of both essential mathematics content and of their students.
- Align strategies with students' needs and math content goals.
- Implement strategies with students and then reflect on their effectiveness.
- Collaborate and plan accessible lessons and assessments.

Deepening Understanding

To reach students with disabilities who struggle in mathematics, teachers need to deepen their understanding of where and why learners with disabilities struggle (Allsopp, Lovin, Green, & Savage-Davis, 2003). We designed workshop activities that explained research findings and raised awareness of difficulties in math that students with disabilities typically have. For example, we gave teachers profiles of students with common difficulties and a process for selecting strategies that aligned with both each student's needs and the math goals of a lesson from their curriculum. We trained teachers to use a protocol for looking at student work to deepen their understanding of their students' learning and to prepare them for using this process in study groups.

The heart of the project was the 16 study groups. In each school, math and special education teachers met biweekly in grade-level groups of 4–9 members. Throughout the first year these groups used the protocol for looking at student work, and throughout the second year they used a protocol for accessibility planning. A group facilitator led the protocols, kept the discussions focused, encouraged reflection, and fostered collaboration. To build capacity, administrators selected these facilitators from each participating school, and our project staff trained them. We selected separate math coordinators and teachers as facilitators and trained them to create safe forums for open discourse.

Teachers examined student work together, focusing on understanding their students as math learners. The presenting teacher provided background information on a lesson, including the math goals and classroom practices used. Then the group closely examined samples of students' work from that lesson and shared observations. Teachers looked for evidence of students' understanding of math content and evidence of where students were having difficulties. Together, the group members brainstormed questions they could ask

to reveal more about students' understandings and strategies to make the mathematics more accessible. Finally, each teacher made a follow-up plan to use specific strategies.

In one group session, for example, teachers examined the work of three students who were comparing data on two coordinate graphs that had different y-axis scales. One student had drawn an incorrect conclusion, appearing to compare the values on just the x -axis without considering the y -axis. The teachers came up with possible reasons for the difficulty: Perhaps the student did not understand that each point represents two values, did not realize the importance of looking at the scales, or had difficulty reading the graphs.

To figure out where understanding might be breaking down, the group generated questions to ask the student, such as, “What does this point represent?” and “How did you come to your conclusions?” They also brainstormed strategies to make coordinate graphs more accessible. To help students grasp that each point represents two values, group members suggested giving students more experience collecting data and plotting it on coordinate graphs using different scales. To help students read the graphs, they suggested providing enlarged copies of them.

Four practices helped study groups use the protocol for looking at student work more effectively:

- *Examine work from a range of learners.* We focused each meeting on three students so that teachers could examine the work in depth. Educators took turns bringing in work from their “focal” students whom they had chosen to represent the range of learners in their classes (Colton, Langer, & Goff, 2003). For example, Martha chose a high performer, a typical student, and a student with special needs, whereas Kate chose three students with different disabilities.
- *Have facilitators lead.* Sharing work from struggling learners can be scary: Teachers worry that the work will reflect badly on their teaching. Facilitators kept discussion focused on understanding student learning without judging students or their teachers.
- *Identify strengths as well as difficulties.* It's easy to focus only on what students *can't do*. The protocol prompts teachers to look first at students' strengths so teachers could get a full picture of their students as math learners and choose strategies that build on strengths.
- *Guide each group to set yearly goals.* Within the broad aim of improving math learning, each group sets specific goals to help decide which lessons to focus on and what student work to collect. For example, one group focused on helping students solve open-response problems; another worked on improving writing about mathematics.

Choosing and Aligning Strategies

Insights gained from examining student work are fundamental to choosing accessibility strategies that genuinely meet students' needs. Accessible math instruction is not just

about the number of strategies teachers use; it's about deciding which strategies to use in which lesson and how to implement each strategy.

The key is alignment: selecting strategies to match both the specific needs of students and the math goals of the curriculum. Teachers in our groups loved to brainstorm accessibility strategies but sometimes got so caught up generating strategies that they forgot to consider which students these strategies were for or which math goals they were addressing—and risked creating strategies that missed the mark.

To avoid such misses, we focused on alignment in both our protocol for looking at student work and our protocol for accessibility planning. In the latter protocol, teachers selected lessons from their common curriculum that were of concern to the group members. They began planning for each lesson by discussing their math goals and identifying priorities. Because math lessons often have multiple goals and teachers may be unsure of what's most important for students to learn and do, selecting priorities was challenging. Although it's tempting to rush through this step, identifying priorities is crucial if some students need to spend more time learning fewer concepts.

Group members next viewed each lesson through an “accessibility lens” to identify potential barriers to learning for their focal students. Keeping the goals they had prioritized in mind, they brainstormed ways they might help individual students circumvent those barriers.

For example, one meeting focused on a lesson on probability. The lesson involved creating a tree diagram, using it to figure out all possible combinations, and then determining the probabilities of different outcomes. A teacher raised concerns that the process of making tree diagrams was posing barriers for some students with special needs and shared work samples to illustrate these difficulties. One student had put the first parts of the tree diagram so close together that there was no room to draw the branches; this frustrated student gave up and never got to determining probabilities. The teacher asked the group how important it was for students to draw the tree diagram from scratch. Together, they decided that the priority was figuring out probabilities and representing them as fractions and that it wasn't essential for all students to draw the diagram. The teachers created a tree diagram template for students to fill out, if the drawing was an issue.

Implementation: Getting Across the Great Divide

At the end of each group meeting, the teachers decided what strategies they would try out next in their classrooms. Moving strategies across the great divide from professional development to classroom practice was harder than we anticipated, however. Every group had a few members who consistently returned with experiences to share, but other members who, despite enthusiastic participation in discussions, rarely went from talk to action. To increase teacher action on strategies, we made the following practices a part of our professional development work:

- *Set clear expectations.* When we introduced the protocols to teachers and in our facilitator training, we emphasized the expectation that teachers would follow up by trying out the strategies.
- *Manage meeting time effectively.* Without careful facilitation, groups can run out of time to plan follow-up actions. Facilitators helped make sure that everyone left the meeting with a plan. Making the most of meeting time required planning; we decided ahead of time which lessons to focus on at which gatherings. We helped teachers coordinate their discussion of math goals and strategies with their curriculum sequence, so they had strategies ready to implement when they needed them.
- *Provide forms.* Teachers fill out a follow-up action form, using check boxes to list what strategies they would use, when they would use them, and how they would look for evidence of effectiveness.
- *Infuse new ideas.* To prevent study group discussions from losing momentum, we offered two workshops a year on such topics as assessment and math vocabulary. These new ideas recharged the group's conversations and participants' motivation.

Clearing the Way for Collaboration

All the steps in improving student learning—examining work, planning strategies, and so on—were strengthened when math and special education teachers collaborated. However, bringing math teachers and special educators together does not by itself foster collaboration; if meetings are unproductive or contentious, they may have the opposite effect. Math teachers and special educators have their own jargon, which can lead to misunderstandings. When a discussion centers on content, math teachers tend to dominate, often shutting out the “voice” of special educators. Tensions may arise from differing expectations for students with disabilities.

We found that three practices helped avoid these challenges:

- Use protocols like those described here to keep meetings focused.
- Establish ground rules to ensure that all participants treat one another respectfully.
- Have teachers work together on common tasks early, so they see the benefits of sharing expertise.

Collaboration cannot be rushed. It took time to build cohesive groups. Over the project's two years, the discussions became richer as educators became more comfortable voicing different opinions and asking colleagues for help.

Observable Benefits

Participants came to this program looking for ways to help their students with disabilities learn math. After two years, nearly all teachers who answered the survey we administered (94 percent) reported that they had changed their thinking about teaching mathematics to students with disabilities. Eighty-five percent said they had expanded their repertoires of instructional strategies. The benefit most cited was collaboration; 85 percent of teachers

said they were more likely to ask other teachers for ideas and strategies since going through the program.

These reports were supported by our classroom observations. For example, we saw Martha incorporate more strategies into her teaching. Kate became more comfortable with the math curriculum, and now feels better able to align strategies to math goals. They still face challenges, but now they readily turn to each other for ideas and support.

References

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Endnote

¹ More information about Addressing Accessibility in Mathematics, including downloadable materials, is available at www.edc.org/accessmath

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